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RELOCATING DLA STOCK AT CLOSING AND DEACTIVATING WAREHOUSES

by

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In the past five years, the Base Realignment and Closure Commissions (BRAC) have ordered the Defense Logistics Agency (DLA) to close or deactivate 15-20 distribution centers. Consequently, DLA has been forced to relocate millions of items of wholesale stock to the remaining depots. Past relocation actions have placed most, if not all, displaced stock at one of the Primary Distribution Sites in Susquehanna, PA and at San Joaquin, CA without regard to the expected location of demand for that stock. We present a method for relocating stock that places stock near its expected demand points, thus reducing future delivery costs and logistics response time.

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RELOCATING DLA STOCK AT CLOSING AND DEACTIVATING WAREHOUSES

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ABSTRACT

In the past five years, the Base Realignment and Closure Commissions (BRAC) have ordered the Defense Logistics Agency (DLA) to close or deactivate 15-20 distribution centers. Consequently, DLA has been forced to relocate millions of items of wholesale stock to the remaining depots. Past relocation actions have placed most, if not all, displaced stock at one of the Primary Distribution Sites in Susquehanna, PA and at San Joaquin, CA without regard to the expected location of demand for that stock. We present a method for relocating stock that places stock near its expected demand points, thus reducing future delivery costs and logistics response time.

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GLOSSARY

Active Item: An item with a recorded Annual Demand Frequency (ADF) of 6 or more. Includes material purchased to meet specific war reserve requirements.

Annual Demand Frequency: Average number of requisitions submitted against a line item per year.

Consolidation and Containerization Point: A facility whose purpose is to combine shipments from multiple shippers to generate full container or air pallet loads of cargo for shipment direct to receivers.

Disposal Release Order (DRO): Authorization issued by an IM to a DLA Distribution Center to dispose of an obsolete or long-stock item.

Distribution Center: a high-volume, mechanized distribution facility that is specifically designed to provide worldwide support for general commodities. They combine high throughput capacities at normal operating tempos with surge and Consolidation and Containerization Point (CCP) processing capabilities to form the foundation of DLA's capability to meet the mobilization, deployment and sustainment requirements. Defense Depot, San Joaquin and Defense Depot, Susquehanna are the DLA Distribution Centers.

First Destination Transportation Charge: Transportation charges associated with the initial movement of material from a vendor to the consignee. Also known as inbound freight charge.

Inactive Item: An item with a recorded Annual Demand Frequency (ADF) of less than six. It is material not expected to be consumed within the budget period but is likely to be used in future years.

Inventory Control Point (ICP): The activity within a DoD supply system that is assigned responsibility for the material management of a group of items either for a particular service or the DoD. Material inventory management includes cataloging, requirements computation, procurement, distribution, repair, and disposal.

Item Manager (IM): Synonymous with Inventory Control Point (ICP).

Material Release Order (MRO): Authorization from an IM to a DLA Distribution Center to issue material to a requesting organization.

Percentage Recurring Demand Allocation (PRDA): The amount of demand a given depot has had attributed to it for any one line item based on the actual requisitions that have generated from that area over the past year. If the requisition is filled by a depot

outside of the original depot's area, the filled requisition is still credited to the original depot in order to credit that depot with item demand within its area of responsibility.

Redistribution Order (RDO): Authorization issued by an IM to a DLA Distribution Center to reposition one or more line items to a new issuing center.

Second Destination Transportation Charge: Transportation charges associated with the movement of material from an inventory location to a customer. Can be referred to as outbound freight charge.

Storage Depot: Facilities designated as wholesale storage sites for specific commodities (e.g. MRE's, chemical suits, bottled gases, etc.), War Reserve Material (WRM), and/or low activity items with poorly defined demand patterns. They are generally not co-located with major military service customer concentrations. Examples include hazardous material storage sites at Richmond, VA and San Diego, CA.

Support Centers: Designed to support local customer requirements and provide global support for material which because of specific item characteristics require special handling or has a unique storage requirements associated with it. An example is Defense Distribution Center, Norfolk, VA.

Workload Capacity: Quantity of material release orders or redistribution orders that can be processed that can be processed (shipped or receipted) within a specified time period by a DLA depot.

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I. INTRODUCTION

A. GENERAL

This thesis evaluates the method used by the Defense Logistics Agency (DLA) to reposition wholesale stock, and offers an alternate to that method. We review and summarize DLA's stock positioning policy, and evaluate a DLA repositioning plan. Ultimately, we introduce a substitute method for repositioning wholesale stock - one designed to save operational funds for DLA in the long run. DLA's current positioning policy requires material to be located at sites "Closest-to-the-Vendor" except under special circumstances (DLA Stock Positioning Policy, 1994). DLA has not promulgated a written policy for repositioning wholesale stock upon ordering a DLA warehouse or depot to close; therefore, it is not bound to any procedure when repositioning. All wholesale stock repositioning decisions are developed on a case-by-case basis, thus creating possible inconsistencies in repositioning stock and duplication of analytical effort.

B. BACKGROUND

Recent Base Realignment and Closure (BRAC) Commission decisions require DLA to reposition wholesale stock from a number of facilities. BRAC decisions have affected or will affect 15-20 different DLA storage locations around the world. DLA must relocate stock from both domestic and overseas locations. With this many closures, there is a need for a consistent, economical and efficient method for repositioning DLA-owned stock. A considerable number of DLA instructions, studies and reports currently guide management decisions for positioning stock. However, none specifically addresses

the repositioning of entire warehouses of inventory.

In 1994, DLA promulgated an order adopting a positioning policy of stocking spares in locations that are "Closest-to-the-Vendor," based upon a study conducted by DLA in 1992. The 1992 study showed that there is a significant reduction in first destination transportation charges when using a "Closest-to-the-Vendor" policy (Bertrand, 1992). DLA adopted its current material positioning posture to lower overall first destination transportation charges.

There are no associated first destination transportation charges in the relocation of wholesale stock from closed warehouses, because BRAC funds are used to pay transportation and relocation expenses. We analyze the economic impact of alternate methods of repositioning wholesale stock, from placing all relocating material at one location to positioning the most active stock close to the customer to lower the cost of issuing stock.

C. RESEARCH OBJECTIVES

The objectives of our thesis are to analyze DLA's method of repositioning stock when a depot is ordered closed, to develop an alternate approach to that used by DLA, and to compare the two methods. We expect to present an inventory relocation model that will ultimately help serve DLA customers better by improving logistics response time for active material undergoing relocation. The model could standardize the way that DLA implements relocation plans for closing sites. Also, our model is designed to minimize future transportation and issue costs.

D. SCOPE

We examine the DLA Stock Positioning Policy, DLA studies that evaluate methods of positioning stock, and discuss how the advantages of DLA policy can be combined with findings of the stock positioning studies to present a decision making model for an enhanced procedure for repositioning of wholesale stock.

E. METHODOLOGY

To support our analysis, we reviewed memorandums, policy notices and studies from DLA and conducted telephone and electronic mail interviews with DLA and military officials. Our comprehensive document review focused on inventory positioning, stock relocation, depot capacity constraints, and improvements in logistics response time. These resources provided background data for formulating our alternative plan. When actual data were used, it was obtained from DLA. We used data from actual relocations to make assumptions about the demographics of material involved in relocations. Additionally, our interviews via electronic mail and telephone with inventory control and relocation managers within DLA and the military helped us gain insight and perspective into current relocation methods. We were unsuccessful in our attempts to compare our model to commercial practices. We contacted private firms that had recently conducted stock relocations and consolidations. Each firm was unwilling to share strategy or lessons learned.

We used a sample of line items managed by DLA to establish averages for quantity of active stock, depth of active stock, and material mix of binnable, medium bulk, heavy bulk and hazardous material. We applied the averages to more than 620,000 line items of

material at Defense Depot, Ogden. We calculate and compare estimated relocation costs for a DLA relocation plan and the model developed in Chapter IV.

F. OVERVIEW

Chapter II contains background information on the philosophy and development of the current DLA positioning policy. We summarize some of the significant studies used by DLA to draft and promulgate its current material positioning policy. Included in the chapter is a portion of the DLA Stock Positioning Policy.

Chapter III evaluates a recent DLA repositioning implementation plan. It covers the relocation of more than 620,000 line items from Defense Depot, Ogden. We present the advantages and disadvantages of the DLA redistribution method. Included is an estimated total cost for DLA's implemented plan, using a number of assumptions about the demographics of the material located at the Defense Distribution Center Ogden, UT (DDOU).

Chapter IV outlines the basis for presenting an alternate method for repositioning and develops a decision tree model for relocation decision making. The plan incorporates demand data into its algorithm, data excluded from consideration in the DLA plan summarized in Chapter III. The model considers demand data when deciding where to reposition wholesale stock with the greatest demand. We compare our model to the current DLA method for stock relocation.

Chapter V summarizes the research and model composition, presents conclusions, and makes recommendations about the use of stock demand for developing a repositioning policy.

II. DLA's POSITIONING POLICY

A. BACKGROUND

For several years, the Defense Logistics Agency (DLA) studied low cost stock positioning options. DLA commissioned several studies to determine the most economical method for positioning inventory and issued memorandums to put stock positioning policy into effect. The current positioning policy is designed to satisfy the Armed Services' need for expeditious supply system response to maintain readiness. DLA's research culminated with the promulgation of a Stock Positioning Policy signed on 12 December 1994 (DLA Stock Positioning Policy, 1994). DLA stated that its new policy "will in the aggregate, decrease logistics response time, reduce the average number of depots an item is stored in, and save over $17 million per annum in handling and transportation costs" (DLA Stock Positioning Policy, 1994, pg i). Additionally, the new policy gives Item Managers (IM) at the Inventory Control Points (ICP) freedom to position stock where the IM believes it will save on storage and transportation costs and positively affect customer readiness.

B. DLA STOCK POSITIONING POLICY

Stock positioning policy refers to the method and location for positioning inventory. DLA's objective in establishing stock positioning policy is to minimize first and second destination transportation costs, and to reduce the amount of handling necessary to satisfy customer demands. To maximize customer service and readiness, DLA researched stock positioning alternatives for positioning both closest-to-the-customer and closest-to-the-vendor. The current policy is a hybrid of the two concepts.

1. Literature Review

In 1991, DLA was using a closest-to-the-customer stock positioning policy. This despite an Army Logistics Studies Office technical report that concluded a closest-to-the-customer stock positioning policy is more costly than a closest-to-the-vendor policy (Grover, 1985). The report noted that although a high state of readiness can be maintained by positioning near the customer, and second destination transportation costs supporting this system were low, those savings were more than offset by greater non-recurring costs (start-up costs), increased inventories, higher related holding costs, and increased first destination transportation charges (Grover, 1985). A study completed in June 1991 provided more evidence that a closest-to-the-vendor policy could save the DLA more than $10.5 million annually if DLA reversed course and used a closest-to-the-vendor stock positioning policy (Jernigan, 1991). The study recommended "that items should be stocked in depots under a 'least cost' strategy." Conclusions recommended further study before adjusting stock positioning policy and implementing a depot consolidation initiative (Jernigan, 1991).

These studies were followed by research completed in August 1991, written by Capt David Bertrand, USAF. He analyzed the effect of consolidating DLA material at primary stock positioning locations in response to prospective workload reductions as a result of the Armed Services' reduced force structure. The study investigated the effect of using a "hub" distribution system, combining workloads and material from 30 depots into three, with the reduced capacity sites either closing or serving as Customer Support Centers. A total cost review of the system included evaluation of first destination

transportation charges, second destination transportation charges, and receipt and issue processing charges. The model for this study was set up to determine the least number of Primary Distribution Sites (PDS) required to satisfy the expected reduced workload. It also determined whether or not the system could satisfy the DLA's supply support workload for the lowest cost, while not exceeding the PDS workload capacity by more than 25 percent for any of the selected PDS locations. Ultimately, the model narrowed the PDS choices to three: Mechanicsburg/New Cumberland, PA; Memphis, TN; and Tracy/Sharpe, CA (Bertrand, 1991).

Capt Bertrand followed that study with one aimed at showing how the PDS system has a "least cost" when it is combined with a closest-to-the-vendor positioning policy. One significant conclusion made in this study was that despite the estimated increase in transportation costs of $6 million per year by using just two PDSs, the reduction in operations and maintenance costs could overcome the transportation increase associated with using two PDSs instead of three. He recommended further study into determining accurate item processing costs to establish true system costs associated with stock distribution. He points out the need to calculate "the differences in processing costs between sites, what goes into these costs, and how changes in the amount and makeup of ... workloads ... affects per unit processing cost" as a means to reform stock positioning and reduced inventory costs (Bertrand, 1992, pg 5-1).

Bertrand's work was followed by a stock policy analysis to determine what type of policy provides the lowest cost for the three PDS system (Hobbs and Lanagan, 1992). The study revealed that for each year from 1988 through 1990, a closest-to-the-vendor policy

would have reduced first destination transportation expenses and receipt costs overall by $55 million. It stated that this savings more than offset an expected increase in second destination transportation charges of $27 million. Research revealed that stocking close to vendors significantly reduced inbound transportation charges by requiring vendors to ship to one site instead of multiple sites as required under a decentralized policy. The study did not address the impact on DLA customers of using a closest-to-the-vendor policy (Hobbs and Lanagan, 1992).

A 1993 study by the Defense Logistics Agency Operations Research Office (DORO) evaluated stock positioning policy that addressed Navy-specific stock positioning concerns (Lanagan and Noll, 1993). An objective of the study was to "develop (if possible) a 'rule of thumb' for deciding when it was more cost effective to store a category of items near a Navy location" (Lanagan and Noll, 1993, pg v). One Navy concern was whether items transferred to DLA management under the Consumable Item Transfer (CIT) Program would be stocked near large Navy demand areas. Another concern centered on the elimination of intermediate level retail stocks for DLA managed items and where that stock would be positioned in the future. Results of the study failed to establish a "rule of thumb" for positioning former Navy material by Federal Supply Class (FSC), but it did conclude that stocking predominantly ex-Navy stock at San Diego or Norfolk could potentially save $29 million in operating costs over the next cheapest DLA sites at Susquehanna or San Joaquin. The leading contributor to the estimated annual savings was the concentration of DLA customers within 50 miles of Norfolk and San Diego.

2. Current Policy at DLA

DLA's objective in establishing its current policy was to "maximize customer responsiveness while minimizing ... stockage, distribution, and transportation costs" (DLA Stock Positioning Policy, 1994, pg i). DLA sought to:

- position material in a minimum number of locations,
- place material with predictable and high demand closest-to-the-customer, and
- centrally locate material requiring "special handling" (i.e. hazardous material, bottled gas, pilferable).

Low demand or inactive items are positioned centrally under the closest-to-the-vendor concept (DLA Stock Positioning Policy, 1994). The hybrid policy of positioning items either closest-to-the-vendor or customer is the result of combining the economic advantages of both policies which were trumpeted in the studies done by DORO. DLA believes its current policy provides "Best Value to the Customer" stock positioning. DLA's current operating policy is the following:

1. Policy

a. The number of Defense Depots that an item is stored in shall be minimized commensurate with the response time requirements of the customers. In general, an item should not be stored in more locations than absolutely necessary to conform to the stock positioning policy. However, it may be stored in fewer locations if the level of service remains consistent with the needs of the customer and the intent of this policy. Therefore, the maximum number of Defense Depots an individual item can be stored in is not prescribed. Nevertheless, if it exceeds four a review should be conducted to verify that more than four sites is warranted. Material recently received through the Consumable Item Transfer (CIT) program, or that has experienced substantial returns, is excluded from this review requirement since separate policy dictates that it be held in place until sold or disposed of.

b. Items with unique characteristics or special handling requirements will be centrally stored in accordance with the DLA Depot Storage Management Plan. Current categories for these items are listed in attachment (1) [of the DLA Stock Positioning Policy].

c. Material not falling under the purview of subparagraph b will be stored at a Defense Depot if 5 percent or more of the total annual system demand occurs within 100 miles of it, or if the customers within the same 100 mile radius use at least 200 units of issue annually. The quantity stored at the depot will be equal to their Percentage Recurring Demand Allocation (PRDA).

d. Material will be stored at Defense Depots co-located with major customer concentrations (listed in attachment (2) [of the DLA Stock Positioning Policy]) if it is designated as weapon system or maintenance critical and the item manager and customer have mutually determined that it must be located at a specific Defense Depot to be responsive to local customer requirements.

e. In accordance with DoD 4140.26M, locations that the Services have identified to DLA as having wholesale assets to be decapitalized under the CIT process that are not current Defense Depots will be used as attrition sites until stock lines have been exhausted, relocated or disposed of. Stocks at locations outside the continental United States (OCONUS) will be considered first for satisfying requisitions from the same theater and last for requirements outside of the theater area. This action will minimize the risk of incurring high transportation costs from using OCONUS locations as general attrition sites.

f. Since DLA will not have visibility of demand patterns for newly transferred CIT items, procurement for CIT material with less than one year of specific demand history will be directed to storage as follows:

(1) Ex-Navy items will have 60 percent of the procurement's quantity assigned to Defense Depot Norfolk Va., and 40 percent assigned to Defense Depot San Diego Ca.

(2) Ex-Air Force items will have 100 percent of the procurement's quantity assigned to the Defense Depot Co-located with the losing Air Logistics Center.

(3) Ex-Army items will have 50 percent of the procurement's quantity assigned to the Defense Depot Susquehanna Pa, and 50 percent assigned to Defense Depot San Joaquin Ca.

(4) Ex-Marine Corps items will have 50 percent of the procurement's quantity

assigned to Defense Depot Albany Ga, and 50 percent assigned to Defense Depot Barstow, Ca.

g. Active items whose total quantity does not fall under the purview of the conditions delineated in subparagraphs b through f will be stocked at the East and West Coast Distribution Center sites. The amount stored at each site will be in accordance with their respective PRDA unless one Distribution Center has recorded 75 percent or more of the total system demand. Also in calculating the PRDA the East Coast Distribution Center will be attributed with all demand occurring east of the Mississippi River up to and including the Southwest Asia theater of operations, except for that which is attributed to another site meeting the subparagraph b criteria or that which has occurred within 100 miles of another Defense Depot meeting subparagraph c or d qualifications to stock the material. Demands occurring west of the Mississippi River up to, but excluding, the Southwest Asia theater of operations will be attributed to the West Coast Distribution Center, except for the exclusions previously noted for the East Coast Distribution Center.

h. Inactive material not meeting the conditions delineated in subparagraphs a through f will be stored in accordance with the DLA Depot Storage Management Plan.

i. ICPs are authorized to make exceptions to the guidance provided in subparagraphs a through h if they can demonstrate that doing so: makes good economic sense and will not adversely affect response time; or that it will markedly improve readiness. Deviations from the aforementioned guidance for large segments of material (such as entire commodity groups) require prior DLA headquarters approval of the business case.

C. POSITIONING POLICY SUMMARY

Figure 1 illustrates the DLA Stock Positioning Policy. The note in that figure refers to the freedom an ICP has to position stock in the DLA system when stock develops a deterministic demand pattern and DLA can realize savings on second destination transportation charges by placing the material in the depot closest to the customer. Additionally, the ICP will consider the effect on a customer's readiness when positioning material deemed critical by the ICP and DLA customers. As stated in the introduction of this chapter, DLA makes every effort to satisfy the needs of its customers. They relied on the focus of several studies to determine the best method of delivering

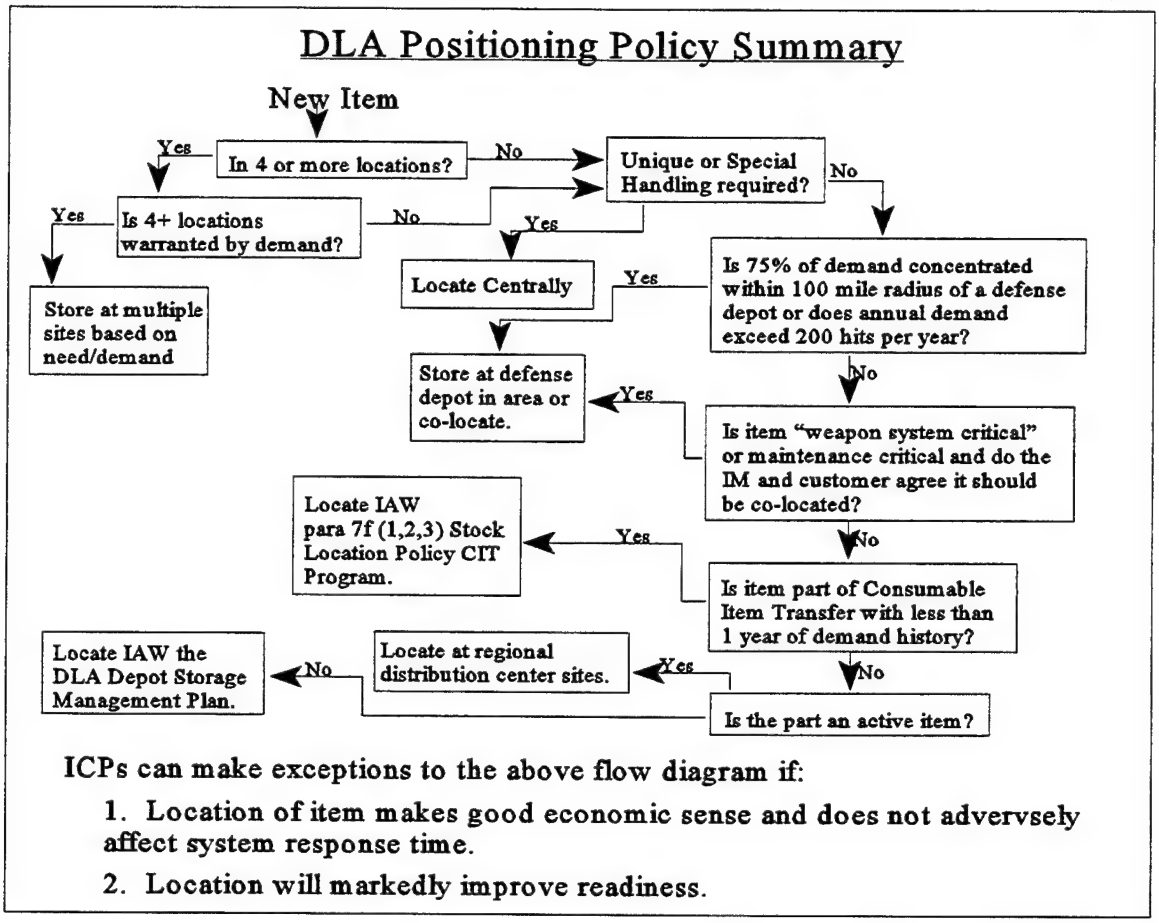

Figure 1 Summary of DLA Stock Positioning Policy

goods rapidly, supporting customer readiness, while working towards holding inventory at the lowest cost. Incorporation of the DLA Stock Positioning Policy helps DLA improve logistics response time for its customers. The current hybrid policy places high volume items close to the customer, while low volume and specialty items are positioned at centralized locations.

III. CURRENT REPOSITIONING PRACTICES

A. INTRODUCTION

Although the Defense Logistics Agency (DLA) has not promulgated an official policy for stock repositioning, the number of Base Realignment and Closure Commission (BRAC) decisions to close DLA Support Centers and Storage Depots highlights the need for DLA to have a well-defined method of repositioning material from the affected sites. According to DLA, 15-20 different storage locations world-wide have been or will be affected by BRAC decisions (Brock, 1996). Here we review and analyze one of DLA's past relocation actions.

Two fundamental differences exist between the initial positioning of stock and repositioning. Positioning involves fine-tuning the location of wholesale stock to satisfy the customer service objectives of a positioning policy. Operating funds pay for transportation costs. Repositioning involves moving large amounts of different line items from one location to one or more receiving activities. If the relocation is the result of a BRAC decision, then BRAC funding pays all associated transportation costs, otherwise, DLA operating funds must be used to pay for the relocation (Brock, 1996).

In this chapter, we consider the process and procedures used by DLA when closing a facility and repositioning the associated wholesale stock. In particular, we review a relocation plan drafted because of a BRAC decision.

B. CURRENT DLA REPOSITIONING PLANS

DLA tasks the respective Defense Distribution Regional Headquarters staff (located either at Susquehanna, PA or San Joaquin, CA) with developing and executing

relocation plans for all base and warehouse closures. Each plan formulation is handled as a separate event. Appendix A contains an example of a DLA repositioning plan and the timetable for implementation and execution of the plan. This example is the result of a BRAC decision, necessitated by the downsized military. The following assumptions are made about DLA's past repositioning plans:

- Prior relocation plans addressed the movement of all general wholesale stock from a closing activity to a Primary Distribution Site (PDS),
- DLA's past repositioning plans have the same basic format,
- Material relocation decisions are collaborations between DLA regional headquarters and Item Managers (IMs) and movement is based upon the material Federal Supply Classification (FSC) codes,
- Material obsolescence decisions are made by the Inventory Control Point (ICP).

1. Repositioning Plan Structure

Relocation plans used by DLA in the past have had similar composition. The closure plans are typically divided into three sections. We consider only the last section, the Material Movement Plan. Appendix A is a copy of the last section of a closure plan. It contains four subsections entitled: Objectives, Assumptions, General [Information], and Redistribution Schedule.

a. Objectives

Material movement plans begin with an outline of inventory-related objectives. This part of the DLA Closure Plan gives the closing activity guidelines to follow and goals to accomplish as it proceeds through the repositioning process. Each DLA relocation plan tends to have similar objectives. The closing organization must:

- Complete the project within prescribed time frames,

- Minimize the expense of material movement paid by the Defense Business Operating Fund (DBOF),

- Minimize the number of customer issues made by the closing facility, thus concentrating workload efforts on shipping stock out of the facility. This is accomplished by moving active material first, and

- Assist in fulfilling the responsibilities required by the local Redevelopment Authority for a smooth transition to civilian control of warehouses, if the relocation is associated with a base closure, or if DLA is a tenant command, return custody of the facilities to the host command.

b. Assumptions

The plan originator makes assumptions about the entire relocation process. The assumptions in a DLA relocation plan vary depending on the nature of the material designated for relocation and the type of storage facility being closed. For example, Navy sites support waterfront areas, whereas Army sites support large geographic areas, and assumptions may deviate because of differences in the facility's infrastructure and types of material carried. Assumptions encompass areas from inventory control by the ICPs, funding support, attrition expectations, and disposal rates:

- Outstanding procurement orders are adjusted by the ICPs to divert material away from the closing facility to sites expected to receive repositioned material. Also, the ICPs will maximize the use of Disposal Release Orders (DROs), thereby minimizing the possibility of moving obsolete material,

- Material requisitions within the closing facility's geographic region will be filled using material from the closing facility. The closing activity is placed at the top of the Source Preference File, a file that prioritizes activities for the disbursement of stock to requisitioners. This maximizes issues from the closing site and reduces

unnecessary relocations. DLA assumes that attrition combined with planned disposal will reduce stock by 10% (See Appendix A),

- Material repositioning will be completed 90 days prior to facility closure allowing adequate time for facility clean-up,
- Funding will be sufficient throughout the relocation evolution,
- Approximately 90% of all stock line items must be relocated,
- All frustrated material (item discrepancies) will be resolved before warehouses are turned over to the local Redevelopment Authority or host activity, and
- Stock stored in DLA warehouses that is owned or managed by other organizations (Army, Air Force, GSA, Navy) will be redistributed or disposed of through coordination between DLA and the appropriate manager.

c. General Information

This portion of the relocation plan addresses the movement of general wholesale stock, material requiring special handling, and the disposition of reimbursable workloads performed at the closing site. It notes that:

- All general stock is to be shipped to the nearest PDS,
- All stock requiring special handling or storage (radioactive, gas cylinders, hazardous material) will be shipped to the central activity responsible for storage of those items, and
- The ultimate disposition concerning the transfer of reimbursable operations is the result of a coordinated effort between the DLA regional office, the closing facility, customers who utilize the operations, the prospective new operation sites and other activities as required.

d. Redistribution Schedule

Whenever possible, DLA accelerates redistribution schedules to close or relocate distribution activities quicker than required by BRAC decisions. This is done to

remove excess capacity from the DLA system and eliminate fixed operational costs. For example, Defense Distribution Center, Ogden (DDOU) was ordered closed no later than 1999. DLA has accelerated its closure schedule in order to close the Ogden depot by September 1997. DLA uses the following steps to reposition wholesale stock:

- The Defense Distribution Regional Office, along with the responsible ICP, develops a redistribution schedule for a steady flow of Redistribution Orders (RDO) based upon Federal Supply Classification (FSC),
- Active material is moved first to reduce workload dedicated to filling customer requisitions. Once active material is relocated, the closing facility concentrates its efforts solely the task of repositioning material,
- The closing site and the receiving PDS possess the ability to fine-tune the relocation schedule as their respective workload capacities allow. A time line is drafted to determine the estimated number of weeks needed to relocate all stock. The workload capacity at both the closing and receiving sites determines how many line items can be transferred each week.

Figure 2 is a pictorial representation of the DLA repositioning implementation plan.

2. DLA Repositioning Plan Review

DLA's model for preparing and implementing material repositioning plans is deliberately simple, directing all of its material to PDSs. The repositioning plans are designed to support the centralization of material, thus reducing the number of depots responsible for world-wide customer support.

a. Advantages

There are distinct advantages associated with DLA's current relocation plans. The most prominent advantage stems from the plan's simplicity. DLA planners separate commodities by FSC and leave it up to the ICPs to determine which line items

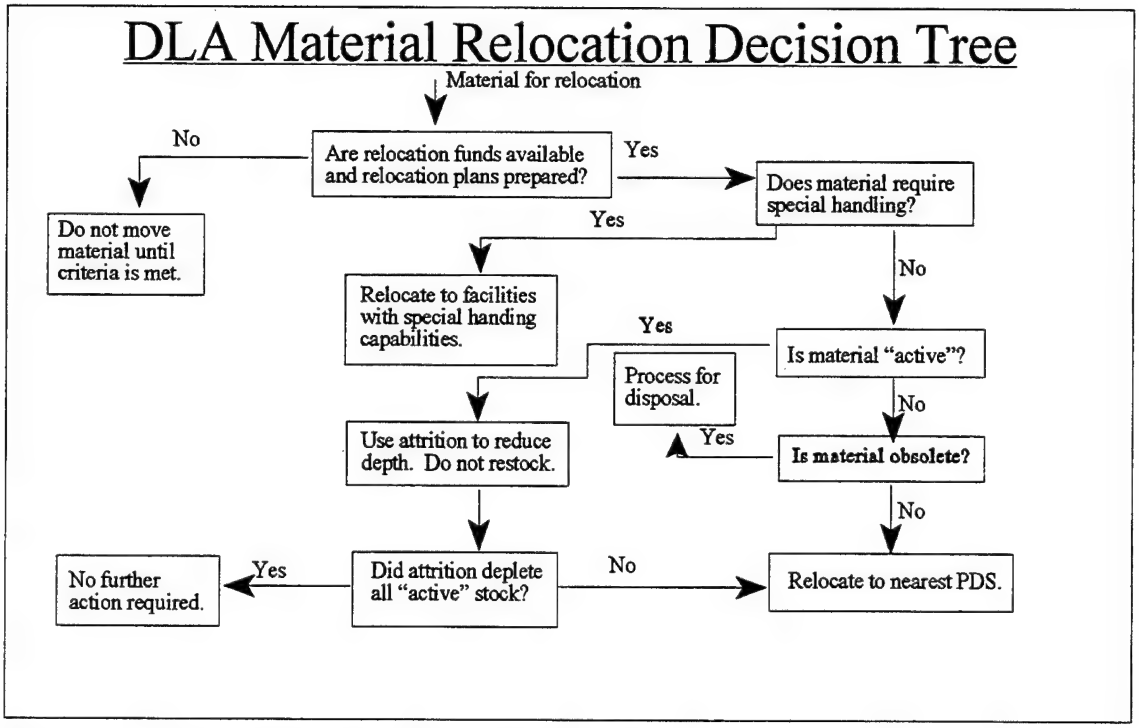

Figure 2 DLA Relocation Plan Decision Table

get transferred each week. ICPs issue RDOs. Material processing workload (the number of line items that can be processed by the shipping or receiving facility per week) for the shipping and receiving sites is steady and continuous throughout the transfer. All general material is shipped to one destination. There is no question about where to send general commodities.

Other advantages include a steady flow of work per week, the use of attrition for reducing the depth and quantity of items requiring relocation, and the relocation of active material first.

Receiving activities can count on receiving an equal number of line items per week. Throughout the relocation operation, workloads at both sites dedicated to material movement remain constant and do not exceed either site's maximum workload

capacity. The flow of material can be adjusted (increased or reduced) as the workload capacity at either site allows. Case in point, the relocation of material from DDOU was accelerated when both the shipping and receiving sites displayed the capacity for transferring more line items per week. This is known as crashing the schedule. DLA dedicated more resources to the relocation effort to pull out of DDOU facilities sooner than required.

Using attrition of active material to reduce the total amount of material requiring repositioning saves BRAC closure funding. As active material is issued to customers, it is not replenished. Items that are out of stock do not require relocation.

Moving active material first, if it has not been depleted from the closing site, allows the workforce at the closing site to concentrate on moving material out of the closing facility while spending less time filling Material Release Orders (MRO).

b. Disadvantages

A critical review of Appendix A reveals some disadvantages to DLA's repositioning process. Notably, system-wide historical demand for wholesale stock at the closing site is not considered in the redistribution of material. By excluding demand information, DLA does not consider system-wide customer concentrations for its active material that is moved from a closing site. A percentage of recurring demand allocation (PRDA) of 5% for a support center means that 5% of DLA system-wide demand is made by customers of that support center. For instance, if an item is moved from DDOU and that item has a PRDA greater than 5% at another DLA support center, the other support center is not considered as a possible destination for the displaced material.

Another disadvantage is that all material is sent to just one destination (a PDS). This precludes taking advantage of material consolidation at co-locations. Sending all general material to one location potentially increases the number of inventory co-locations for some stock. For stock not previously carried at the receiving activity, new locations for those stock items are created, defeating some of the cost savings from closing an activity. This means that an additional depot will incur holding costs (the cost to carry inventory) for an item in the DLA system. Maximizing the use of consolidation reduces system-wide inventory holding costs.

3. Estimating the Cost of the DLA Repositioning Plan

To estimate the cost of DLA's repositioning plan, we need additional assumptions about the material and methods used in repositioning. Some assumptions mirror those made by DLA in Appendix A; others establish a benchmark for costing the model developed in the following chapter.

a. Freight rates

Using contracted motor freight traffic rates , truckload shipments from Ogden, UT to San Joaquin, CA are $901 per load. We will use this rate regardless of the type of commodities carried.

b. Repositioning Material Volume

Based upon DLA's DD-805 Storage Space Report for Ogden, UT dated 31 December 1995, the volume of wholesale stock held at DDOU is 23,853,000 cubic feet. DLA assumes that 70% of this volume will require relocation. Thus, 16,697,100 cubic feet of wholesale material requires relocation.

c. Freight Units

Each of the contracted carriers hired for the relocation will use 45'l x 8'w x 9'h trailers and the broken stowage factor for each trailer is 17%; that is, trailers will be 83% full on average. Trailers are assumed to be volume constrained rather than weight constrained.

d. Shipping and Receiving Rates

All relocating material incurs a cost for shipment from the closing site and a receipt cost at the destination. Appendix B contains the DLA Receipt and Issue Transaction Cost Table. The rates for FY 96 are applied to each line item.

e. Material Cube Classification

We must establish material volume thresholds in order to classify stock by its cube. This provides the criteria for determining how much it will cost to reposition each line item. For instance, we must establish the threshold for differentiation of between bin and bulk material. Those parameters are below.

- Binnable items have a cube measurement less than or equal to one cubic foot,
- Medium Bulk items have a cube measurement greater than one cubic foot but less than 40 cubic feet,
- Heavy bulk items have a cube measurement greater than 40 cubic feet (for issue/receipt cost assignment, hazardous material is grouped with heavy bulk items).

These parameters, along with an estimate of item mix, allow us to use the pricing schedule in Appendix B for estimating the total cost of relocating all items at DDOU. We assume that the item ratio at DDOU does not match DLA's system-wide

item mix. For the 620,000 line items of stock at DDOU, 55% are binnable, 20% are medium bulk and 25% are heavy bulk and hazardous material. DDOU carried an unusually high percentage of heavy bulk and hazardous items since it is the central hazardous cite for DLA's western region. Ordinarily, DLA's stock ratio at general stock depots is equivalent to 65% binnable, 25% medium bulk and 10% heavy bulk and hazardous. Our estimate of the DDOU item mix ratio percentages were confirmed by DLA representatives (Brock, 1996). They are consistent with the percentages published in 1991 after the Consumable Item Transfer (CIT) Program was initiated (Bertrand, 1991).

The calculation of costs for this relocation are intended only to establish a benchmark cost. By applying the above assumptions to the redistribution effort from Ogden, UT to San Joaquin, CA, our estimated cost for the relocation is $34.5 million. DLA budgeted $44.6 million for DDOU's relocation. That budget included $12.8 million for transportation; we estimated that the cost of transportation was $5.4 million. Our estimate differs from DLA's budget, in that we did not account for the extra expense required for the transportation of hazardous material. DLA did account for that added expense, thus the higher cost for their estimate.

f. Receipt Cost for "Not Previously Carried" Material

Material received at the PDS, or any other DLA depot, from the closing site that was previously "not carried" by the receiving site is accounted for the same way as those items received that are "carried" by the depot. DLA does not differentiate between carried and not carried items when assigning receipt cost. According to DLA

officials, the function of tracking and storing "carried" and "not carried" items is identical. Hence, DLA assumes the cost of shipping and receiving each type of item is the same.

We combined our assumptions and DLA's repositioning plan and summarized our cost calculations in Table 1.

C. SUMMARY

DLA's relocation plans are brief and easy to implement. Their simplicity keeps development cost down and makes plan conformity easy. Plans are flexible to allow both the closing facility and receiving facility to adjust the flow of material within the relocation pipeline. Increases or decreases in material flow depends on workload capacity and resource allocation. DLA encourages schedule crashing, that is, reallocating resources at one or both depots involved in the relocation to accelerate the flow of material, in order to vacate a closing facility earlier than planned and reduce system-wide operating expenses from their operational budget.

We estimate the cost to BRAC funds for relocating 620,000 line items is $34.5 million. DLA estimated that only 90% of the 620,000 required relocation. Our estimate establishes the average price per line item for relocating the remaining 560,000 items at $55.64 per item. This average cost per line item includes the costs for transportation, picking, packing, receipt and stowage. The depth of an item is not considered as a contributor to the average cost of relocating the line item. DLA assigns the same marginal cost per line item whether it is moving an item with a depth of one or a depth of 10,000.

Estimated Cost of Relocating DDOU Stock

DDOU Material Cube as of 31DEC95	23,853,000
Less 30%Assumed Attrition and Obsolescent Cube	-7,155,900
Cube of Material to be shipped to the PDS	16,697,100
Divide by 83% of the volume for a 45' trailer	÷ 2,689
Number of Trailer Loads needed to relocate material	6,029
Guaranteed Traffic Rate from DDOU to DDJC	x $ 901
Total Transportation Expense	$5,432,129

Line Item Cube Distribution

Binnable Line Items	560,306 x 55% =	308,168
Medium Bulk Line Items	560,306 x 20% =	112,061
Heavy Bulk and Hazardous Items	560,306 x 25% =	140,076

	Issue Cost[1]		Rcpt Cost	Total * # of Items	
Binnable Items	$13.62	+	$16.38	= $ 30.00 x 308,168=	$ 9,245,040
Medium Bulk Items	$26.48	+	$19.88	= $ 46.36 x 112,061=	5,195,148
Heavy Bulk and HAZMAT	$64.26	+	$40.07	= $104.33 x 140,076=	+14,614,129
				Total Issue and Receipt Cost	$29,054,317
				Total Transportation Cost	+ 5,432,129
ESTIMATED Total DDOU Relocation Cost					**$34,486,446**

Table 1 Calculated Cost of Relocating DDOU Wholesale Stock

[1] Cost figures are the DBOF Issue and Receipt Cost for FY 96 from Appendix B.

IV. STOCK RELOCATION DECISION MODEL

A. INTRODUCTION

In this chapter, we present an alternative to DLA's method for wholesale stock repositioning. We introduce a decision making model that is constrained by depot capacities and percentage recurring demand allocation (PRDA) for prospective relocation sites. We introduce stock demand as an important determinant for relocating active stock. The decision model positions items with the greatest demand close to the customer, in support of the DLA Stock Positioning Policy (1994) and positions inactive and low-demand items at the Primary Distribution Site (PDS) closest to the vendor (DLA Stock Positioning Policy, 1994).

1. Background

A General Accounting Office (GAO) symposium conducted in 1994, which included 5 reengineering executives from private industry, addressed methods for improving government processes. The executives stressed the need for applying "best business practices" to DoD functions (GAO 96-5, 1996). GAO noted that "Major improvements and savings are realized [when] focusing on the business [of distribution] from a process rather than a functional perspective." (GAO 96-5, pg 35). In developing our repositioning model, we focused on the process of redistribution for stock, with our sites on the long term economic benefit, rather than the mere function of stock relocation. We present a modified decision model for relocating wholesale stock that satisfies the objectives from paragraph 7 of the DLA Stock Positioning Policy (1994). The logic in our model addresses the disadvantages in DLA's current relocation plans. Ultimately, our

model can help DLA avoid unnecessary future second destination transportation charges and issue expenses, reducing total costs for relocated stock.

2. Objectives

We support the objectives of the DLA Stock Positioning Policy of maximizing customer responsiveness and minimizing inventory holding, distribution, and transportation costs (DLA Stock Positioning Policy, 1994). This is done in our model by:

- Repositioning active stock to locations where PRDA is greatest,
- Limiting the number of prospective receiving sites with qualifying PRDAs to four,
- Repositioning material with special handling requirements or non-definitive demand patterns at central locations,
- Using inventory consolidation to reduce system-wide inventory requirements and associated holding costs, and
- Increasing the number of on-base material issues to lower system-wide stock issue costs.

3. Assumptions

We continue to use the assumptions we made in the previous chapter. As noted before, the price assumptions are a benchmark for establishing cost. Table 1 in Chapter III is not the actual cost for repositioning wholesale stock from Ogden, UT to San Joaquin, CA, but rather an estimate for comparison. In calculating the cost of implementing DLA's plan, we estimated the total quantity of active stock at Defense Distribution Center, Ogden (DDOU) based upon an item mix ratio provided by DLA. We assume that active items have well-defined demand patterns. This will be important when we compute the payback period for our relocation model. Finally, we assume that wholesale material in

the DLA system is proportionally distributed; in other words, if a depot has a PRDA of 20%, then 20% of DLA's system-wide depth is carried at that depot.

B. RELOCATION DECISION TREE

Some DLA depots designated for closure may carry more than 500,000 line items. Because of that, we limit the decision process application to just active stock by stratifying the data.

1. Stock Database Stratification

Wholesale material requiring relocation must satisfy screening criteria before final relocation decisions can be made. The first prerequisite for full analysis is quantity of stock demand. Before considering material for relocation to DLA depots other than a PDS, we separate active stock from inactive, obsolete, dead and special handling required stock. The second criterion that the material must satisfy is that the remaining active material must have a well-defined demand pattern during the previous two years. Well-defined demand patterns reveal just where the customers are located for DLA material and which depots should hold that material. We estimate that these two criteria reduce the number of items qualified for relocation from DDOU to DLA depots, other than a PDS, to about 42,000 of 620,000 line items.

2. Co-location Consideration

According to the DLA Stock Positioning Policy (1994), positioning material at more than four locations requires special consideration by the IM. Our model will not violate this restriction. We limit the number of co-locations eligible to receive material during the redistribution to four. One of these four co-locations must be the PDS in the

same geographic region as the closing depot. This restriction allows DLA to use a PDS to satisfy world-wide demand for all stock under its supervision. There is only one exception to this rule: DLA notes that if a depot has a PRDA of 75% or greater for any one item, then that depot will be the exclusive stock point for that item (DLA Stock Positioning Policy, 1994). We agree with DLA "single stock point" exclusivity, but maintain that the 75% threshold is too high. LTs Murphy and Hickmon claim that if any one depot experiences a PRDA of 60% or greater for any one item, then that item should be relocated to the depot with that high PRDA (Murphy, 1994, Hickmon, 1995). LTs Murphy and Hickmon showed in their theses that second destination transportation charges are lowest for all stock experiencing 60% or more of its demand within the vicinity of one depot (Murphy, 1994; Hickmon, 1995).

3. Co-location Distribution

In our model, unless one site satisfies the 60% criterion from above, the PDS will always be a prospective receiving site. To satisfy DLA's constraint of four co-locations for stock, a maximum of three other sites can qualify for relocation consideration. Other prospective sites must have a PRDA greater than or equal to 5%. The number of co-locations do not need to equal four. If there is only one depot with a PRDA greater than 5%, then that depot receives a percentage of stock equal to its PRDA from the closing depot, and the remaining stock is relocated at the PDS. DLA's Stock Positioning Policy (1994) directs that stock will be allocated to depots in quantities proportional in depth to the depot's PRDA. Prospective destinations for stock must not be among those selected for closure by any of the Base Realignment and Closure (BRAC) Commissions.

4. Capacity Constraint

Any prospective receiving site must have available space. If a prospective site is at or above 95% capacity, then material earmarked for that depot will be redirected to the PDS. For our analysis, we assumed that each prospective receiving depot was below 95% capacity.

Figure 3 is a representation of our relocation decision tree.

C. DECISION TREE APPLICATION

To apply our relocation decision model to the DLA active stock at DDOU, we require the entire active stock database that contains DDOU stock PRDA, the PRDA for each item with a co-location, and the depth and cube for each item. We were unable to obtain this data. To establish a basis for comparing our model with DLA's method, we created a sample database of 100 random stock items resembling DDOU stock and applied both models to that data.

1. Application Data Summary

We used our decision model to process our random data set; the analysis revealed that:

- 72% of active stock items would be relocated to four depots,
- 11% of active items would be shipped to three co-locations,
- 9% of active items would be directed to two sites,
- 8% of active items would be relocated to just one location, and
- 75% of line items designated for one depot only have a PRDA greater than 60% and the prospective site is not a PDS.

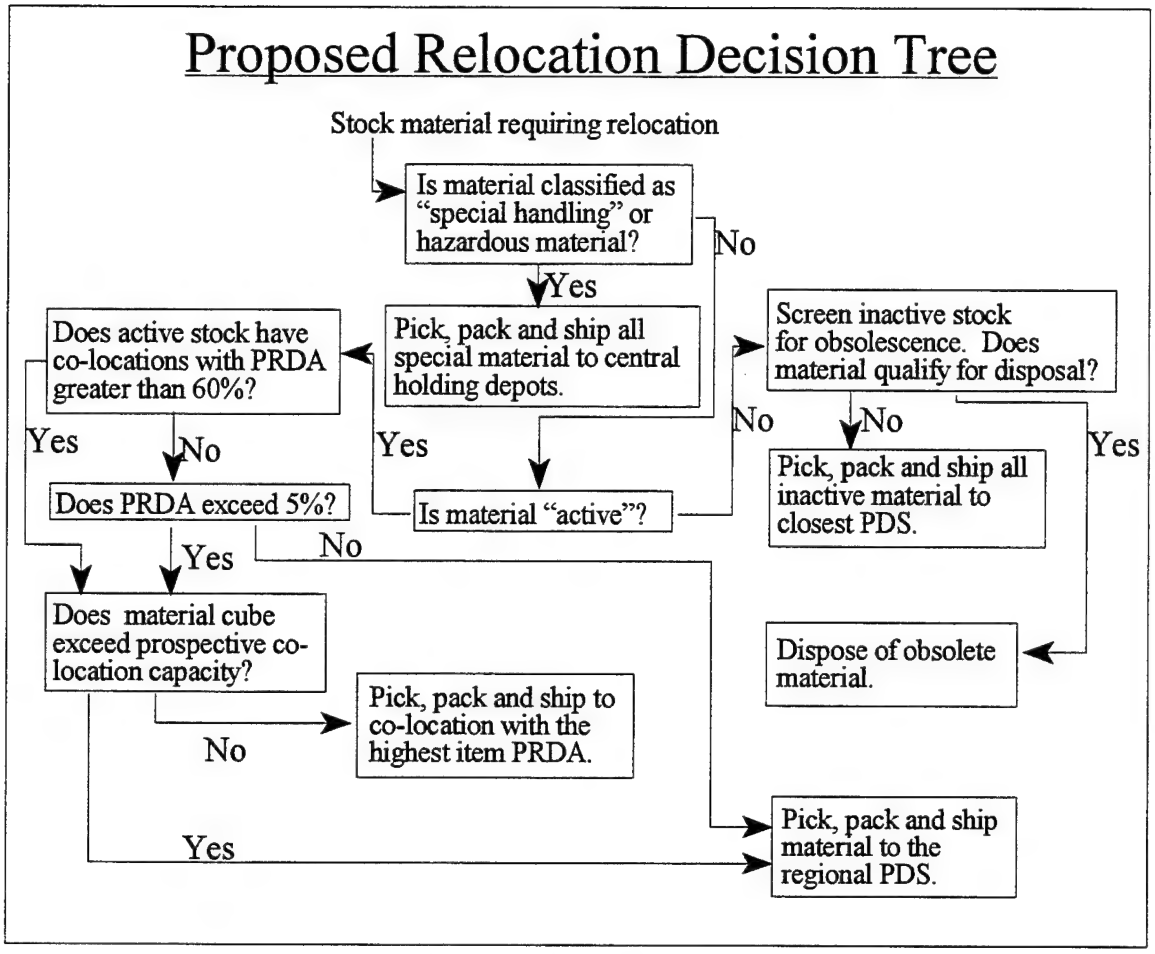

Figure 3 Relocation Model Decision Flow Diagram

The distribution of material encompasses depots from San Diego in the West to Norfolk in the East. The projected percentage of active line items going to each depot ranges from a high of 94% for San Joaquin CA to a low of 3% for Albany GA. Table 2 displays the projected percent of DDOU's active items that would be shipped to each DLA depot having PRDAs greater than 5% for the DDOU active stock. For example, one item at DDOU has a depth of 50 and co-locations at Defense Depot, San Joaquin (DDJC) and Defense Depot, Red River (DDRT). If DDRT's PRDA for that item is 10%,

then five units or 10% of the DDOU's depth would be shipped to DDRT and the balance sent to DDJC (since DDJC is the regional PDS). This example item would be one of the projected 27% of all DDOU active sample items having a co-location with DDRT. Thus, the figures in column 1 of Table 2 reflect the percentage of stock from our DDOU sample that have co-locations with other depots. Column 1 reflects that in our random sample of active stock, 90% have a PRDA greater than 5% at Susquehanna, making it a co-location for that material, 56% have qualifying PRDAs at Oklahoma City, 50% qualify for shipment to Warner-Robbins, and so forth.

We estimate that 92% of the active stock items would be relocated to multiple sites. The remaining 8% have PRDAs equal to or greater than 60%.

The Military Traffic Management Command, Western Area office in Oakland, CA provided the trailer-load cost figures we use, from the CONUS Freight Module (CFM), for each prospective receiving depots. Appendix C contains the transportation rate schedules for the prospective receiving depots.

2. Estimated Relocation Costs

If an item is to be relocated at multiple depots, then the cost to issue that material from the closing depot is higher. Hence, for each line item that is shipped to four sites, for example, that line item will issued four times. Issuing a binnable item four times, therefore, will cost $54.48 per line item, while the issue cost for the same item in the DLA plan is $13.62. Receipt costs are also proportionally higher. In the above example, our plan would have a receipt transaction cost of $65.52 per line item for material going to four depots verses a receipt transaction cost of $16.38 for DLA's plan. Additionally,

Active Material Distribution from DDOU		
% of Active Stock Items[2]	Depot Location	Transportation Cost per Trailer Load of Stock[3]
94%	San Joaquin (DDJC)	$ 901
90%	Susquehanna (DDSP)	$ 1845
56%	Oklahoma City (DDOC)	$ 999
50%	Warner-Robbins (DDWG)	$ 1444
27%	Red River (DDRT)	$ 1213
13%	Norfolk/Richmond (DDNV)	$ 1666
11%	Jacksonville (DDJF)	$ 1731
11%	San Diego (DDDC)	$ 771
6%	Barstow (DDBC)	$ 656
3%	Albany (DDAG)	$ 1473

Table 2 Co-location Distribution Table

most of the depots used in our model have higher transportation costs associated with relocating material to them.

We performed a sensitivity analysis on our data set results to test the range of possible outcomes from our model. We varied the number of depots selected to receive stock from the relocation, the percentage of items for relocation to DLA Support Center depots, using other than the lowest cost carriers for different destinations (from Appendix C), and adjusting the cube mix ratio (binnables versus medium and heavy bulk) for

[2] Does not include Hazardous or Special Handling Required material.

[3] From MTMC schedule in Appendix C.

material going to various depots. Our model was somewhat insensitive to changes in transportation rates. The difference in cost between using the low cost carrier and using the highest cost carrier was 0.2%.

Changes in the number of depots or the amount of material to those depots had a much greater effect on the cost of implementing our plan. Using only the PDSs as prospective receiving sites resulted in a 4.2% difference in the cost between relocation plans. Appendix D shows the results from select sensitivity analyses.

Table 3 is an estimate of the cost to implement our plan for relocating DDOU stock. We applied DLA's relocation method and our model to our random sample data. We estimate that our plan would cost 13.9% more than DLA's method to relocate stock for DDOU, for a total cost of $39.3 million.

3. Decision Model Breakeven

We estimate that our plan would cost DLA 13.9% more for a complete relocation of DDOU stock, an increase equal to $4.8 million over DLA's current relocation plan. The higher cost is the result of increased issue/receipt costs for the higher multiple of issues, and higher average transportation charges. If each of the active items that are relocated is issued throughout the DLA system the minimum number of times to qualify the material for active stock status, then we estimate that DLA should realize a minimum "issue cost" savings of approximately $2.1 million in the first year after relocation, based on DLA's policy costs per issue listed in Appendix B. In other words, if binnable line items have six demands in one year to qualify for or maintain active status, then DLA would realize a marginal savings of $5.13 per issue, for medium bulk items the marginal

Estimated Cost of Relocating DDOU Stock Using the Proposed Relocation Plan

Inactive Material Summary - Transport Cost

DDOU Material Cube as of 31DEC95		23,860,000
Less 30%Assumed Attrition and Obsolescent Cube		-7,155,900
Cube of Material to be relocated	Subtotal	16,704,100
Divide by 83% of the cube for a 45' trailer		÷ 2,689
Number of Trailer Loads needed to relocate material throughout the system		6,212
Number of Trailer Loads needed to relocate active stock (42,000 items)		- 470
Number required to relocate inactive material		5,742
Traffic Rate from DDOU to DDJC		* $ 901
Transportation Expense for inactive material		$5,173,542

Issue/Receipt Transaction Cost[4]

Binnable Line Items = Σ ((42,000*.7)*depot %) * $30.00	=	$3,184,020
Med Bulk Line Items= Σ ((42,000*.2)*depot %) * $46.36	=	1,405,821
Hvy Bulk and Haz Items= Σ((42,000*.1)*depot %) *$104.33	=	+ 1,581,851
Subtotal Issue/Receipt Cost for Active Items		$6,171,692
Issue/Receipt Expense for Inactive Material (518,306 items * resp rate)		+27,344,707
Subtotal for all Issues/Receipts + Inactive Matl Transportation		$38,689,941

Active Material Transportation Cost[5]

Σ (10 Prospective Destination Rates * Respective Allotted Cube)	=	+ 610,176
ESTIMATED Total DDOU Relocation Cost using Proposed Plan		$39,300,117

Table 3 Calculated Cost of Relocating DDOU Wholesale Stock - Proposed Plan

[4] See Appendix E for Issue/Receipt cost computation for 10 prosposed depot destinations.

[5] See Appendix E for Transportation cost summary for each proposed destination.

savings per issue is $10.24, and for heavy bulk and hazardous items, the marginal savings is $26.93 per issue. We estimate that when 42,000 items experience six issues each, DLA could save between 33% and 45% in issue costs in the first year. That means the higher initial cost of our plan is overcome in at most three years. The length of time before DLA realizes a cost savings from our plan depends on the demand activity of the stock items that were relocated. DLA would realize future cost savings based upon the number of items issued, as long as the material is located where the stock demand is greatest.

4. Plan Advantages

There are several advantages to our plan. First, relocation decisions are made based upon historical stock demand, and high demand stock is repositioned closest to the customer.

Our model repositions stock at locations that are close to customer concentrations. That means lower rate issue costs because stock is where the customer is. The result is an improved logistics response time (LRT) for the customer. Reduced LRT can influence customer readiness, an objective of the DLA Stock Positioning Policy (1994).

Our decision tree is general enough in nature to apply it at other locations. Our plan relocates wholesale stock where demand is concentrated. It could be adapted for use by the service components to relocate their stock when faced with the task of closing a supply center.

Our plan shifts a workload capacity bottleneck from receiving sites to the closing depot. Since the closing site concentrates its workforce efforts into relocating stock, with multiple sites to ship to, stock would move out of the closing site faster, shortening the

time needed to close the site.

Ultimately, using this model would prove economical for DLA, since Item Managers have the authority to position stock where it satisfies demand, it does not compromise readiness and is economical for DLA and its customers (DLA Stock Positioning Policy, 1994).

5. Plan Disadvantage

The greatest disadvantage to our relocation plan is the higher initial transportation cost to implement. Our plan will cost an estimated $4.8 million more to reposition material, but in the long run, the higher relocation cost will save DLA money in material issue costs by having more active material closer to the customer.

D. SUMMARY

DLA's current method for relocating material is logical in all but how it deal with active material having with a PRDA greater than 5% at co-locations. We argue that relocating the active stock to the three co-locations for that stock with the highest PRDA above 5% would prove cost effective to DLA in the long run. Our decision model provides a way to reduce future operating costs by relocating active material close to the customer, saving on second destination transportation charges and material issue costs.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The objectives of our thesis were to examine how DLA conducted wholesale stock relocations, to develop an alternate method for managing relocations, and to compare the two plans and recommend a more efficient approach to relocating active stock. The basis for our plan was the incorporation of historical stock demand into DLA's method for relocating high demand or active stock.

Chapter II introduced information from stock positioning studies that provided the background for DLA's current stock positioning policy. We noted how DLA's material positioning policy uses premises to determine when and where to position stock. DLA's objective for positioning stock is to maximize customer responsiveness while placing stock where it is in the greatest demand.

Chapter III introduced a relocation plan currently utilized within DLA. We reviewed the plan and made assumptions about the cost to implement the plan. DLA verified our cost assumptions as fair and reasonable. We estimated that DLA's plan cost $34.5 million to relocate stock from the closing Defense Depot, Ogden. We presented advantages and disadvantages to DLA's plan. We noted the lack of consideration for stock demand.

In Chapter IV, we introduced modifications to the DLA relocation plan that considers stock demand and co-locations for active stock. We believe that these two considerations are important when deciding where and how much active stock should be repositioned in the DLA system. We inserted demand and depth data into our model,

made assumptions about the cost to implement and provided logic on when DLA can expect to reap savings in operational funds with the use of our decision model.

We estimated our plan would cost $39.3 million to implement for the Ogden depot. Using our model reduces second destination transportation charges, providing a marginal "issue cost" savings, since active stock would be positioned close to customers. We estimated that DLA's annual savings would be at least $2.1 million per year until the relocated active stock is attrited. The more active stock that DLA issues because of this relocation, the quicker our plan's higher cost is negated and operational funds are saved.

We conducted sensitivity analysis of our data and determined that even though our decision model may have a higher implementation cost, the cost difference was not great enough to disavow our plan. Advantages of our plan include the benefits of improved logistics response time (LRT) for DLA customers, the use of demand data to relocate stock where demand is highest, and a marginal cost savings each time a relocated item is issued to a customer. DLA's customers would benefit the most from use of our plan, since active, high demand stock would remain positioned closest to the customer and DLA's logistics response time for that stock improves.

B. CONCLUSION

DLA uses a stock positioning policy that considers demand and customer concentration to provide customers with the most responsive stock distribution system possible, but they do not consider stock demand patterns when relocating material from a closed depot or warehouse. Our plan moves active stock to the depots experiencing the highest demand for that stock. In fact, our model more closely adheres to the demand

consideration requirements of the DLA Stock Positioning Policy than the current method employed by DLA.

C. RECOMMENDATIONS

1. Use Demand Data When Relocating Material

DLA maintains a database with information concerning the demand patterns of active stock. The database can make visible the stock from a closing site with well-defined demand patterns. We recommend that DLA use the demand data to relocate material according to its percentage of recurring demand allocation (PRDA). Our analysis suggests that DLA can save operational funds in the long run if they incorporate demand data when developing material relocation plans.

2. Additional Research is Needed

We examined how DLA relocates its active material throughout its supply support system when encountered with a depot closure. We believe that DLA's current method of relocating all general supply stock at the PDSs may have a negative effect on customer readiness. We recommend investigating the effect on readiness of a DLA customer when a co-located DLA depot is closed and active material is no longer positioned within the vicinity of the co-located customer.

*Transfer files to storage site.

c. *Material Movement Plan:*

(1) Objectives:

(a) Accomplish required closure within time frame prescribed.

(b) Minimize DBOF cost.

(c) Minimize MRO workload as resources decrease by moving active material to Primary Distribution Site or other determined location.

(d) Assist the Base Transition Coordinator in fulfilling responsibilities with Local Redevelopment Authority requirements, as appropriate.

(2) Assumptions:

(a) DLA will issue letters to DLA and Military Service Inventory Control Points (ICPs) immediately to:

1-Turn off new procurement and customer returns, understanding that inprocess flow may continue for a 6 month period or until pipeline is clear. Customer returns must not be held in place.

2- Modify existing contracts to divert incoming material to the Primary Distribution Centers or other designated locations.

3- Maximize disposal, considering the time line available for closure processing, to include zero filling the retention quantity field of the DROs.

(b) DDOU will remain at the top of the Source Preference File for their western geographical area.

(c) All material will be moved by June 30, 1997 permitting final clean up last 90 days.

(d) Available resources will decline as closing process progresses. ISSOT contract may be utilized to makeup resources shortfall.

(e) Sufficient funding will be available.

(f) RDOs will be released in accordance with DDRW planned and modified schedule.

(g) Attrition and disposals will eliminate approximately 10% of the total ~~line~~ items (62,266) and 30% of overall occupied cubic feet.

(h) 90% of the line items (560,306), (70% of occupied cubic feet) will be redistributed.

(i) Material movement process will begin in October/November 1995 with disposal, issues and redistributions being completed through June 30, 1997. During period July 1 - September 30, 1997, remaining inventory discrepancies will be resolved and remaining warehouses will be cleaned and made available for turn over to the Local Redevelopment Authority (LRA).

(j) Material in storage, owned/managed by other than DLA Supply centers (Army 530 lines, Air Force 28 lines, GSA 12 lines, Total: 631 lines) will be redistributed or disposed of as determined through coordination with DDRW-TM and the appropriate owner or manager.

(3) General

(a) DLA Wholesale Stock will be moved to the Primary Distribution Site in accordance with the DDJC Master Storage Plan, except as noted.

1- Asbestos: All products containing asbestos with a unit of issue of other than eaches (i.e. feet, yard, etc.) will be sent to DDDC.

2- Radioactive: Material will be moved to DDJC (Sharpe Site).

3- Cylinders: DDRV (840 Lines).

4- Other Hazardous: DDJC (Tracy Site) or DDRV.

5- Selected NSNs: Case by case determination.

6- PROM Devices: Hill.

7- JAN S Parts: Hill.

8 Instrumentation Tapes: Hill.

(b) The transfer of DDOU reimbursable workload and other specialized operations to their new destinations will be accomplished by DDRW-TM through coordination with DDOU, the reimbursable customer, the potential new site, and other activities, as appropriate. Reimbursable workload and specialized operations/storage, and their potential new destinations are identified below:

1- DEPMEDS - Hill Site
2- Bearing Refurbishment - DDJC
3 Pipe Cleaning - DDRV
4- Cylinder Refurbishment - DDRV
5- Tent Repair - DDJC
6- Fastener Inspection - DDJC
7- Electronic Test Lab - Hill
8- Dry Nitrogen Storage - Hill
9- Humanitarian - establish at new sites, case by case

(4) Redistribution Schedule

(a) DDRW-TM will develop a redistribution (RDO) schedule for moving DLA stocks to their designated sites. The redistribution schedule will identify the number of RDOs to be dropped weekly by each supply center. DDRW-TM will coordinate this schedule with the supply centers, DDOU and the gaining site.

(b) Active material will be moved first in order to minimize DDOU non-BRAC related workload, which will reduce and maintain DBOF cost at a minimum, and permit the DDOU workforce to concentrate on BRAC related work and timelines.

(c) It is anticipated that, as the closure progresses, this schedule will be "tweaked" as required, based on the existing resources and capacities of both DDOU and the receiving depots.

(d) Table 1-1 through Table 1-3 identifies the planned DLA Supply Centers redistribution schedule.

(5) Building (Warehouse) Closures. Since the movement of material out of DDOU is based primarily on supply center activity, it is difficult to identify an exact closure date, earlier than 30 June 1997, for each building (warehouse) except those containing only specific commodities. As the closure process progresses and the redistribution schedule is "Tweaked", adjusted earlier building (warehouse) closure/availability will be realized. Table 2-1 will contain the projected vacate dates and will be published upon receipt of current building/commodity information from DDOU and proper coordination of projected dates.

TABLE 1-1

RDO SCHEDULE SUMMARY
DDOU TO DDJC

ICP	LINES	WEEKS	EST COMP DATE*
DPSC-M	5,400	18	Feb-96
DPSC-C&T	1,559	8	Dec-95
DISC	170,120	67	Feb-97
DCSC	83,327	46	Sep-96
DGSC	27,153	33	Jun-96
DESC	272,747	83	May-97
TOTAL	560,306 **		May-97

*BASED ON START DATE OF 23 OCT 95

** BASED ON F54 REPORT (MAY 95)

** INCLUDES 10% LINE REDUCTIONS FOR DISPOSALS

NOTE: MATERIAL MOVEMENT TO SPECIFIC DDJC SITES (TRACY OR SHARPE) IS BASED ON FSC ASSIGNMENTS. **ACTIVE ITEMS MOVE FIRST.**

DDRW-TM

TABLE 1-2 **MATERIAL MOVEMENT SCHEDULE**
OGDEN TO TRACY

SUPPLY CENTERS		DISC	DESC	DCSC	DGSC	DPSC C&T	DPSC "M"	TOTAL
TOTAL LINES		169,651	0	55,491	17,459	1,559	5,400	249,560
FY 96	WK							
OCT 23, START	1	2,000	0	820	530	200	200	3,750
NOV	2	2,000		820	530	200	200	3,750
	3	2,000		820	530	200	200	3,750
	4	2,000		820	530	200	200	3,750
	5	2,000		820	530	200	200	3,750
DEC	6	2,000		820	530	200	200	3,750
	7	2,000		820	530	200	200	3,750
	8	2,000		820	530	159	241	3,750
	9	2,000		820	530		400	3,750
	10	2,000		820	530		400	3,750
JAN 96	11	2,000		820	530		400	3,750
	12	2,000		820	530		400	3,750
	13	2,000		820	530		400	3,750
	14	2,000		820	530		400	3,750
FEB	15	2,000		820	530		400	3,750
	16	2,000		820	530		400	3,750
	17	2,000		820	530		400	3,750
	18	2,000		1,061	530		159	3,750
MAR	19	2,000		1,220	530			3,750
	20	2,000		1,220	530			3,750
	21	2,000		1,220	530			3,750
	22	2,000		1,220	530			3,750
	23	2,000		1,220	530			3,750
APR	24	2,000		1,220	530			3,750
	25	2,000		1,220	530			3,750
	26	2,000		1,220	530			3,750
	27	2,000		1,220	530			3,750
MAY	28	2,000		1,220	530			3,750
	29	2,000		1,220	530			3,750
	30	2,000		1,220	530			3,750
	31	2,000		1,220	530			3,750
	32	2,000		1,220	530			3,750
JUN	33	2,000		1,251	499			3,750
	34	1,750		2,000				3,750
	35	1,750		2,000				3,750
	36	1,750		2,000				3,750

TABLE 1-2 (CONT) **MATERIAL MOVEMENT SCHEDULE**
OGDEN TO TRACY

FY 96	WK	DISC	DESC	DCSC	DGSC	DPSC C&T	DPSC "M"	TOTAL
JULY	37	1,750		2,000				3,750
	38	1,750		2,000				3,750
	39	1,750		2,000				3,750
	40	1,750		2,000				3,750
AUG	41	1,750		2,000				3,750
	42	1,750		2,000				3,750
	43	1,750		2,000				3,750
	44	2,750		1,000				3,750
	45	2,750		1,000				3,750
SEP	46	3,591		159				3,750
	47	3,750						3,750
	48	3,750						3,750
	49	3,750						3,750
FY 97								
OCT	50	3,750						3,750
	51	3,750						3,750
	52	3,750						3,750
	53	3,750						3,750
NOV	54	3,705						3,750
	55	3,750						3,750
	56	3,705						3,750
	57	3,705						3,750
	58	3,750						3,750
DEC	59	3,750						3,750
	60	3,705						3,750
	61	3,750						3,750
	62	3,750						3,750
JAN 97	63	3,705						3,750
	64	3,750						3,750
	65	3,750						3,750
	66	3,750						3,750
	67	2,060						2,060

ALL RDOs TO BE COMPLETED BY JAN 97

MATERIEL MOVED TO TRACY SITE IS BASED ON DDJC FSC ASSIGNMENT

TABLE 1-3 **MATERIAL MOVEMENT SCHEDULE**
OGDEN TO SHARPE

SUPPLY CENTERS		DESC	DISC	DCSC	DGSC	DPSC C&T	DPSC "M"	TOTAL
TOTAL LINES		272,747	469	27,836	9,694	0		310,746
FY 96	WK							
OCT 23, START	1	2,000	250	1,000	500	0	0	3,750
NOV	2	2,000	219	1,000	531			3,750
	3	2,250		1,000	500			3,750
	4	2,250		1,000	500			3,750
	5	2,250		1,000	500			3,750
DEC	6	2,250		1,000	500			3,750
	7	2,250		1,000	500			3,750
	8	2,250		1,000	500			3,750
	9	2,250		1,000	500			3,750
	10	2,250		1,000	500			3,750
JAN 96	11	2,250		1,000	500			3,750
	12	2,250		1,000	500			3,750
	13	2,250		1,000	500			3,750
	14	2,250		1,000	500			3,750
FEB	15	2,250		1,000	500			3,750
	16	2,250		1,000	500			3,750
	17	2,250		1,000	500			3,750
	18	2,250		1,000	500			3,750
MAR	19	2,132		1,000	618			3,750
	20	2,750		1,000				3,750
	21	2,750		1,000				3,750
	22	2,750		1,000				3,750
	23	2,750		1,000				3,750
APR	24	2,750		1,000				3,750
	25	2,750		1,000				3,750
	26	2,750		1,000				3,750
	27	2,750		1,000				3,750
MAY	28	2,914		836				3,750
	29	3,750						3,750
	30	3,750						3,750
	31	3,750						3,750
	32	3,750						3,750
JUN	33	3,750						3,750
	34	3,750						3,750
	35	3,750						3,750
	36	3,750						3,750

TABLE 1-3 (CONT'D) **MATERIAL MOVEMENT SCHEDULE OGDEN TO SHARPE**

FY 96	WK	DESC	DISC	DCSC	DGSC	DPSC C&T	DPSC "M"	TOTAL
JULY	37	3,750						3,750
	38	3,750						3,750
	39	3,750						3,750
	40	3,750						3,750
AUG	41	3,750						3,750
	42	3,750						3,750
	43	3,750						3,750
	44	3,750						3,750
	45	3,750						3,750
SEP	46	3,750						3,750
	47	3,750						3,750
	48	3,750						3,750
	49	3,750						3,750
FY 97								
OCT	50	3,750						3,750
	51	3,750						3,750
	52	3,750						3,750
	53	3,750						3,750
NOV	54	3,750						3,750
	55	3,750						3,750
	56	3,750						3,750
	57	3,750						3,750
	58	3,750						3,750
DEC	59	3,750						3,750
	60	3,750						3,750
	61	3,750						3,750
	62	3,750						3,750
JAN 97	63	3,750						3,750
	64	3,750						3,750
	65	3,750						3,750
	66	3,750						3,750
	67	3,750						3,750
FEB	68	3,750						3,750
	69	3,750						3,750
	70	3,750						3,750
	71	3,750						3,750

TABLE 1-3 (CONT'D) **MATERIAL MOVEMENT SCHEDULE OGDEN TO SHARPE**

FY 97	WK	DESC	DISC	DCSC	DGSC	DPSC C&T	DPSC "M"	TOTAL
MAR	72	3,750						3,750
	73	3,750						3,750
	74	3,750						3,750
	75	3,750						3,750
APR	76	3,750						3,750
	77	3,750						3,750
	78	3,750						3,750
	79	3,750						3,750
MAY	80	3,750						3,750
	81	3,705						3,750
	82	3,750						3,750
	83	3,246						3,246

ALL RDOs TO BE COMPLETED BY 31 MAY 97
MATERIAL MOVED TO SHARPE SITE BASED ON DDJC FSC ASSIGNMENTS

APPENDIX B: DLA RECEIPT OR ISSUE TRANSACTION COST SCHEDULE

DLA Distribution Depots (DBOF)
Secondary Item
Receipt or Issue Transaction Cost

FY 1996 Secondary Item Rates	On-Base Issues	Off-Base Issues	Off-Base Receipts
Bin	$ 8.49	$ 13.62	$ 16.38
Medium Bulk	$ 16.24	$ 26.48	$ 19.88
Heavy Bulk/Hazardous	$ 37.33	$ 64.26	$ 40.07
Transshipments	$ 3.67		

FY 1997 Secondary Item Rates	On-Base Issues	Off-Base Issues	Off-Base Receipts
Bin	$ 7.25	$ 13.26	$ 19.56
Medium Bulk	$ 12.07	$ 29.89	$ 21.98
Heavy Bulk/Hazardous	$ 22.28	$ 51.73	$ 42.89
Transshipments	$ 3.23		

FY 1998 Secondary Item Rates	On-Base Issues	Off-Base Issues	Off-Base Receipts
Bin	$ 9.09	$ 11.84	$ 21.19
Medium Bulk	$ 15.90	$ 23.08	$ 19.21
Heavy Bulk/Hazardous	$ 36.70	$ 51.23	$ 29.32
Transshipments	$ 0.97		

FY 1999 Secondary Item Rates	On-Base Issues	Off-Base Issues	Off-Base Receipts
Bin	$ 8.78	$ 11.45	$ 20.48
Medium Bulk	$ 15.37	$ 22.31	$ 18.56
Heavy Bulk/Hazardous	$ 35.47	$ 49.51	$ 28.33
Transshipments	$ 0.94		

Annual Storage Cost per Square Foot
Applies to both Principal End Items and Secondary Items

	FY 1996	FY 1997	FY 1998	FY 1999
Covered Storage	$ 5.15	$ 7.17	$ 7.89	$ 7.89
Open Storage	$ 0.48	$ 0.75	$ 0.85	$ 0.85

APPENDIX C: MTMC CONUS FREIGHT RATES FROM CFM

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 2010
Destin: 206709270	DDD MECHANICSBURG	20Z	PA	2R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 2010

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: ~~AV2~~ AV2 AV3 Cap Ld:
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST	* EQU MILE-BRKT WEIGHT-BRKT	TENDER SP FS EFFECT EXPIRE RATE.. RQ* LINE-HAUL PERMIT-COST MISC-COST
	SV RATE... AMT....	SV RATE... AMT....	SV RATE... AMT....
1. $1845.18	HGLS HUB GROUP LOGISTICS SERVICES 800-964-2515 UT PA	002001 00 AV3 999913	2% 08/23/96-07/31/98 0.9000 PM 1845.18
2. $1849.20	AIPA A.R.L., INC. 800-525-2373 412-269-7455 UT 2R	000268 00 AV2 99991301 40000-999999	0% 01/16/96-01/16/98 0.2300 PZ 1849.20
3. $1863.27	MCET MERCER TRANSPORTATION CO 800-626-5375 UT PA	000832 00 AV3 99991301	3% 09/01/96-09/01/98 0.9000 PM 1863.27
4. $1918.99	INFY LANDSTAR INWAY, INC. 510-743-0289 800-241-0263 UT PA	002394 00 AV3 99991301 040000-999999	4% 06/13/96-06/11/98 0.2295 PZ 1918.99
5. $1969.80	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 404-270-1660 UT PA	000637 00 AV3 999913	0% 06/01/95-06/01/97 0.9800 PM 1969.80

REQ.NO:065841 Route Order No: Requestor Id: 191

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560000	OGDEN	76Z	UT	7R	9C	Mileage: 1110
Destin: 626200241	TINKER AFB	62Z	OK	6R	9C	Intra-State:
						TRO: D Svc: D
						Tot.miles: 1110

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld: X
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST	TENDER SP FS EFFECT EXPIRE * EQU COMMODITY RATE.. RQ* LINE-HAUL MILE-BRKT WEIGHT-BRKT PERMIT-COST MISC-COST
1. $999.00	CILG CARTWRIGHT INTERNATIONAL VAN L 816-763-2700 UT OK	000001 00 0% 03/18/96-03/18/98 AY2 999913 0.9000 PM 999.00
2. $999.00	MAFL-MALONE FREIGHT LINES INC 800-229-7791 UT OK	000126 00 0% 07/31/96-01/12/97 AV3 99991201 0.9000 PM 999.00
3. $1021.20	AIPA A.R.L., INC. 800-525-2373 412-269-7455 UT 6R	000268 00 0% 01/16/96-01/16/98 AV2 99991301 0.2300 PZ 1021.20 40000-999999
4. $1028.97	MCET MERCER TRANSPORTATION CO 800-626-5375 UT 62Z	000832 00 3% 09/01/96-09/01/98 AV3 99991301 0.9000 PM 1028.97
5. $1032.30	NWFH NATIONWIDE FREIGHT SERVICE,INC 913-962-8989 913-962-7304 UT OK	000001 00 0% 05/15/96-05/15/98 AY2 999913 0.9300 PM 1032.30

REQ.NO:065846 Route Order No: Requestor Id: 191

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560000	OGDEN	76Z	UT	7R	9C	Mileage: 1951
Destin: 463520000	WARNER ROBINS	46Z	GA	4R	9C	Intra-State:
						TRO: D Svc: D
						Tot.miles: 1951

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld: X
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST SV RATE... AMT....	* EQU COMMODITY MILE-BRKT WEIGHT-BRKT SV RATE... AMT....	TENDER SP FS RATE.. RQ* PERMIT-COST	EFFECT EXPIRE LINE-HAUL MISC-COS'
1. $1443.74	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 404-270-1660 UT GA	AV3 999913	000637 00 0% 0.7400 PM	06/01/95-06/01/97 1443.74
2. $1716.88	MAFL MALONE FREIGHT LINES INC 800-229-7791 UT GA	AV3 99991201	000126 00 0% 0.8800 PM	07/31/96-01/12/97 1716.88
3. $1755.90	NWFH NATIONWIDE FREIGHT SERVICE,INC 913-962-8989 913-962-7304 UT GA	AY2 999913	000001 00 0% 0.9000 PM	05/15/96-05/15/98 1755.90
4. $1755.90	CILG CARTWRIGHT INTERNATIONAL VAN L 816-763-2700 UT GA	AY2 999913	000001 00 0% 0.9000 PM	03/18/96-03/18/98 1755.90
5. $1791.02	HGLS HUB GROUP LOGISTICS SERVICES 800-964-2515 UT GA	AV3 999913	002001 00 2% 0.9000 PM	08/23/96-07/31/98 1791.02

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6

Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 1379
Destin: 661157250	RED RVR AD	66Z	TX	6R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 1379

TOT.Ship: 40000 UOM: P Mode: B

	-- -- -- -MOTOR- --`-- --	-- -- -- -RAIL - -- -- --
Commodity:		
FAK:	999912 Group:	GROUP:
Equipment:	AY2 AV2 AV3 Cap Ld:	
Vehicles:	moved: 1 used: 1	used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST	* EQU COMMODITY WEIGHT-BRKT MILE-BRKT	TENDER SP FS EFFECT EXPIRE RATE.. RQ* LINE-HAUL PERMIT-COST MISC-COST
		SV RATE... AMT.... SV RATE... AMT....	SV RATE... AMT....
1. $1213.52	MAFL MALONE FREIGHT LINES INC 800-229-7791 UT TX	000126 00 AV3 99991201	0% 07/31/96-01/12/97 0.8800 PM 1213.52
2. $1227.31	CILG CARTWRIGHT INTERNATIONAL VAN L 816-763-2700 UT TX	000001 00 AY2 999913	0% 03/18/96-03/18/98 0.8900 PM 1227.31
3. $1268.68	AIPA A.R.L., INC. 800-525-2373 412-269-7455 UT 6R	000268 00 AV2 99991301 40000-999999	0% 01/16/96-01/16/98 0.2300 PZ 1268.68
4. $1278.33	MCET MERCER TRANSPORTATION CO 800-626-5375 UT 66Z	000832 00 AV3 99991301	3% 09/01/96-09/01/98 0.9000 PM 1278.33
5. $1310.05	CVEN COVENANT TRANSPORT INC 800-334-9686 615-629-0393 UT TX	002061 00 AV3 99991301	0% 02/24/96-02/24/97 0.9500 PM 1310.05

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 779
Destin: 889000294	FISC SAN DIEGO	88Z	CA	8R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 779

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld:
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 ORIGIN SV RATE... AMT....	PHONE-2 DEST SV RATE... AMT....	* EQU MILE-BRKT	COMMODITY WEIGHT-BRKT	TENDER SP FS RATE.. RQ* PERMIT-COST	EFFECT EXPIRE LINE-HAUL MISC-COST
1. $771.21	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 UT	404-270-1660 88Z	AV3	000637 00 999913	0% 0.9900 PM	06/01/95-06/01/97 771.21
2. $849.11	KVTN KANKAKEE VALLEY TRANSPORTATION 800-435-4856 UT	801-393-8706 CA	AV3	000703 00 999913	0% 1.0900 PM	03/15/96-03/14/98 849.11
3. $864.69	GDCS GOLD COAST TRANSPORTATION SER. 800-437-3681 UT	CA	AV3	000092 00 99991301 040000-999999	0% 0.2775 PZ	03/03/96-03/01/98 864.69
4. $874.04	HGLS HUB GROUP LOGISTICS SERVICES 800-964-2515 UT	88Z	AV3	002001 00 999913	2% 1.1000 PM	08/23/96-07/31/98 874.04
5. $874.58	HJBT J.B. HUNT TRANSPORT, INC. 800-643-3622 UT	CA	AV3	000947 00 999913	3% 1.0900 PM	11/04/96-11/04/97 874.58

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 2192
Destin: 261100293	NORFOLK NAV SHYD	26Z	VA	2R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 2192

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld:

Vehicles: moved: 1 used: 1 used:

Accessorial:

Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST SV RATE... AMT....	* EQU COMMODITY MILE-BRKT WEIGHT-BRKT SV RATE... AMT....	TENDER SP FS RATE.. RQ* PERMIT-COST SV RATE...	EFFECT EXPIRE LINE-HAUL MISC-COS AMT....
1. $1665.92	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 404-270-1660 UT VA	AV3 000637 00 999913	0% 0.7600 PM	06/01/95-06/01/97 1665.92
2. $2016.64	AIPA A.R.L., INC. 800-525-2373 412-269-7455 UT 2R	AV2 000268 00 99991301 40000-999999	0% 0.2300 PZ	01/16/96-01/16/98 2016.64
3. $2031.98	MCET MERCER TRANSPORTATION CO 800-626-5375 UT VA	AV3 000832 00 99991301	3% 0.9000 PM	09/01/96-09/01/98 2031.98
4. $2038.56	NWFH NATIONWIDE FREIGHT SERVICE,INC 913-962-8989 913-962-7304 UT VA	AY2 000001 00 999913	0% 0.9300 PM	05/15/96-05/15/98 2038.56
5. $2082.40	CVEN COVENANT TRANSPORT INC 800-334-9686 615-629-0393 UT VA	AV3 002061 00 99991301	0% 0.9500 PM	02/24/96-02/24/97 2082.40

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 2164
Destin: 491200292	FISC JACKSONVILLE	49Z	FL	4R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 2164

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld:
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 ORIGIN SV RATE...	PHONE-2 DEST AMT....	* EQU MILE-BRKT SV RATE...	TENDER SP COMMODITY WEIGHT-BRKT AMT....	FS RATE.. PERMIT-COST SV RATE...	EFFECT RQ* LINE-HAUL MISC-COST AMT....	EXPIRE
1. $1731.20	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 UT	404-270-1660 FL	AV3	000637 00 999913	0% 0.8000	PM 1731.20	06/01/95-06/01/97
2. $1990.88	AIPA A.R.L., INC. 800-525-2373 UT	412-269-7455 4R	AV2	000268 00 99991301 40000-999999	0% 0.2300	PZ 1990.88	01/16/96-01/16/98
3. $2164.00	BASM BRANDI & SUZETTE TRUCKING, INC 800-467-9001 UT	FL	AV3	000101 00 99991301	0% 1.0000	PM 2164.00	07/11/96-05/14/98
4. $2164.00	MAFL MALONE FREIGHT LINES INC 800-229-7791 UT	FL	AV3	000126 00 99991201	0% 1.0000	PM 2164.00	07/31/96-01/12/97
5. $2228.92	MCET MERCER TRANSPORTATION CO 800-626-5375 UT	FL	AV3	000832 00 99991301	3% 1.0000	PM 2228.92	09/01/96-09/01/98

REQ.NO:066761 Route Order No: Requestor Id: 980765

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560270	DDD OGDEN	76Z	UT	7R	9C	Mileage: 602
Destin: 880190280	MCLB BARSTOW	88Z	CA	8R	9C	Intra-State:
						TRO: D Svc: A
						Tot.miles: 602

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld:
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. TOTAL-COST MIN	SCAC CARRIER NAME..... PHONE-1 PHONE-2 ORIGIN DEST	* EQU COMMODITY MILE-BRKT WEIGHT-BRKT	TENDER SP FS RATE.. RQ* LINE-HAUL PERMIT-COST MISC-COST	EFFECT EXPIRE
	SV RATE... AMT.... SV RATE... AMT....		SV RATE... AMT....	
1. $656.18	KVTN KANKAKEE VALLEY TRANSPORTATION 800-435-4856 801-393-8706 UT CA	000703 00 AV3 999913	0% 1.0900 PM 656.18	03/15/96-03/14/98
2. $675.00	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 404-270-1660 UT 88Z	000637 00 AV3 999913	0% 0.9900 PM* 675.00	06/01/95-06/01/97
3. $675.44	HGLS HUB GROUP LOGISTICS SERVICES 800-964-2515 UT 88Z	002001 00 AV3 999913	2% 1.1000 PM 675.44	08/23/96-07/31/98
4. $675.87	HJBT J.B. HUNT TRANSPORT, INC. 800-643-3622 UT CA	000947 00 AV3 999913	3% 1.0900 PM 675.87	11/04/96-11/04/97
5. $695.00	GDCS GOLD COAST TRANSPORTATION SER. 800-437-3681 UT CA	000092 00 AV3 99991301 040000-999999	0% 0.2775 PZ* 695.00	03/03/96-03/01/98

REQ.NO:065843 Route Order No: Requestor Id: 191

No. of SCACs: 6 Avail date :11/05/96

	Installation/City	Zone	State	Region	CONUS	
Origin: 761560000	OGDEN	76Z	UT	7R	9C	Mileage: 1990
Destin: 468510000	ALBANY	46Z	GA	4R	9C	Intra-State:
						TRO: D Svc: D
						Tot.miles: 1990

TOT.Ship: 40000 UOM: P Mode: B

-- -- -- -MOTOR- -- -- -- -- -- -- -RAIL - -- -- --

Commodity:

FAK: 999912 Group: GROUP:

Equipment: AY2 AV2 AV3 Cap Ld: X
Vehicles: moved: 1 used: 1 used:

Accessorial:
Protective:

RANK. / TOTAL-COST / MIN	SCAC CARRIER NAME..... / PHONE-1 / PHONE-2 / ORIGIN / DEST	TENDER SP FS / * EQU / COMMODITY / MILE-BRKT / WEIGHT-BRKT / PERMIT-COST	EFFECT EXPIRE / RATE.. RQ* / LINE-HAUL / MISC-COST
		SV RATE... AMT.... SV RATE... AMT.... SV RATE... AMT....	
1. $1472.60	CSRJ CROSSROAD CARRIERS, INC. 800-869-8032 404-270-1660 UT GA	000637 00 AV3 999913	0% 06/01/95-06/01/97 0.7400 PM 1472.60
2. $1751.20	MAFL MALONE FREIGHT LINES INC 800-229-7791 UT GA	000126 00 AV3 99991201	0% 07/31/96-01/12/97 0.8800 PM 1751.20
3. $1791.00	NWFH NATIONWIDE FREIGHT SERVICE,INC 913-962-8989 913-962-7304 UT GA	000001 00 AY2 999913	0% 05/15/96-05/15/98 0.9000 PM 1791.00
4. $1791.00	CILG CARTWRIGHT INTERNATIONAL VAN L 816-763-2700 UT GA	000001 00 AY2 999913	0% 03/18/96-03/18/98 0.9000 PM 1791.00
5. $1826.82	HGLS HUB GROUP LOGISTICS SERVICES 800-964-2515 UT GA	002001 00 AV3 999913	2% 08/23/96-07/31/98 0.9000 PM 1826.82

APPENDIX D: SELECTED SENSITIVITY ANALYSIS SUMMARIES

1. Cost of Proposed Plan using Projected Model Results

Active Material Distribution from DDOU		
% of Active Stock Items[1]	Depot Location	Transportation Cost per Trailer Load of Stock[2]
94%	San Joaquin (DDJC)	$ 901
90%	Susquehanna (DDSP)	$ 1845
56%	Oklahoma City (DDOC)	$ 999
50%	Warner-Robbins (DDWG)	$ 1444
27%	Red River (DDRT)	$ 1213
13%	Norfolk/Richmond (DDNV)	$ 1666
11%	Jacksonville (DDJF)	$ 1731
11%	San Diego (DDDC)	$ 771
6%	Barstow (DDBC)	$ 656
3%	Albany (DDAG)	$ 1473
Total cost to implement plan		$39,300,113.
Cost Difference from DLA's Relocation Method		**+ $ 4,813,671.**

[1] Does not include Hazardous or Special Handling Required material.

[2] From MTMC schedule in Appendix C.

1. Cost of Proposed Plan using Projected Model Results and using the Highest Cost Traffic Provider for Each Depot from Appendix C.

Active Material Distribution from DDOU		
% of Active Stock Items[3]	Depot Location	Transportation Cost per Trailer Load of Stock[4]
94%	San Joaquin (DDJC)	$ 901
90%	Susquehanna (DDSP)	$ 1970
56%	Oklahoma City (DDOC)	$ 1032
50%	Warner-Robbins (DDWG)	$ 1791
27%	Red River (DDRT)	$ 1310
13%	Norfolk/Richmond (DDNV)	$ 2082
11%	Jacksonville (DDJF)	$ 2229
11%	San Diego (DDDC)	$ 875
6%	Barstow (DDBC)	$ 695
3%	Albany (DDAG)	$ 1827
Total cost to implement plan		$39,360,806.
Cost Difference from DLA's Method		+ **$4,874,360.**

[3] Does not include Hazardous or Special Handling Required material.

[4] From MTMC schedule in Appendix C.

1. Cost of Proposed Plan using Projected Model Results for Relocating Stock Only to the PDS.

Active Material Distribution from DDOU		
% of Active Stock Items[5]	Depot Location	Transportation Cost per Trailer Load of Stock[6]
94%	San Joaquin (DDJC)	$ 901
90%	Susquehanna (DDSP)	$ 1845
0%	Oklahoma City (DDOC)	$ 999
0%	Warner-Robbins (DDWG)	$ 1444
0%	Red River (DDRT)	$ 1213
0%	Norfolk/Richmond (DDNV)	$ 1666
0%	Jacksonville (DDJF)	$ 1731
0%	San Diego (DDDC)	$ 771
0%	Barstow (DDBC)	$ 656
0%	Albany (DDAG)	$ 1473
Total cost to implement plan		$35,987,873.
Cost Difference from DLA's Relocation Method		**+ $ 1,501,427.**

[5] Does not include Hazardous or Special Handling Required material.

[6] From MTMC schedule in Appendix C.

1. Cost of Proposed Plan using Projected Model Results with Adjustments to the Percent of Material Going to Each Depot

Active Material Distribution from DDOU		
% of Active Stock Items[7]	Depot Location	Transportation Cost per Trailer Load of Stock[8]
96%	San Joaquin (DDJC)	$ 901
92%	Susquehanna (DDSP)	$ 1845
25%	Oklahoma City (DDOC)	$ 999
25%	Warner-Robbins (DDWG)	$ 1444
20%	Red River (DDRT)	$ 1213
20%	Norfolk/Richmond (DDNV)	$ 1666
5%	Jacksonville (DDJF)	$ 1731
9%	San Diego (DDDC)	$ 771
3%	Barstow (DDBC)	$ 656
3%	Albany (DDAG)	$ 1473
Total cost to implement plan		$38,129,524.
Cost Difference from DLA's Relocation Method		**+ $ 3,643,078.**

[7] Does not include Hazardous or Special Handling Required material.

[8] From MTMC schedule in Appendix C.

LIST OF REFERENCES

Bertrand, David E., "Primary Distribution Site (PDS) Location Analysis," Rept. No. DLA-91-P10173. Defense Logistics Agency Operations Research and Economic Analysis Office, Cameron Station, Alexandria, Virginia, August 1991.

Bertrand, David E., "Primary Distribution Site (PDS) Location Analysis with Closest to Vendor Stockage Policy," Rept. No. DLA-92-P20130. Defense Logistics Agency Operations Research and Economic Analysis Office, Cameron Station, Alexandria, Virginia, September 1992.

Brock, Michael, Inventory Specialist, Defense Logistics Agency Headquarters, Washington, D.C., Interviews conducted, June-December 1996.

__, DLA Stock Positioning Policy. Defense Logistics Agency Headquarters, Cameron Station, Alexandria, Virginia, December 12, 1994.

Grover, Paul E., "Wholesale Stock Positioning and Distribution Policies," Logistics Studies Office (Army), Fort Lee, Virginia, August 1985.

Hickmon, Byers L., LT, USN. "DLA Stock Location Policy Based on Percentage of System-wide Demand: Focus on the Norfolk Geographic Region," Master's Thesis, Naval Postgraduate School, Monterey, California, June, 1995.

Hobbs, Jeffery J. and Thomas P. Lanagan, "Stock Location Policy Analysis, Rept. No. DLA-92-P10148. Defense Logistics Agency, Operations Research and Economic Analysis Office, Cameron Station, Alexandria, Virginia, August 1992.

Jernigan, Rick, "Bulk Stock Location Study," Rept. No. DLA-91-P81076. Defense Logistics Agency Operations Research and Economic Analysis Office, Cameron Station, Alexandria, Virginia, June 1991.

Lanagan, Thomas P. and Charles R. Noll, CPT, USA, "Comparative Cost and Support Pattern Analysis for High Demand Navy Customers Under a Single Site Storage Option," Rept. No. DLA-93-P20159. Defense Logistics Agency Executive Director (Plans & Policy Integration), Cameron Station, Alexandria, Virginia, July 1993.

Murphy, Gary T., LCDR, USN, "DLA Stock Location Policy Based on Percentage of System-wide Demand", Master's Thesis, Naval Postgraduate School, Monterey, California, June 1994.

United States General Accounting Office Report Number 96-5, "Best Management Practices-Reengineering the Air Force's Logistics System Can Yield Substantial Savings." GAO Report to the Ranking Minority Member of the Subcommittee on Oversight of Government Management, February, 1996.

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